IN THE CLAIMS:

Please amend claims 1, 2, and 4-6 as follows:

1. (Amended) A membrane-separated, bipolar multicell electrochemical reactor for half-cell reduction and oxidation reactions in respective positive and negative liquid electrolyte solutions without gas evolution, said reactor comprising:

a plurality of alternately disposed bipolar plate electrode elements and ion exchange membrane separator elements defining a positive electrolyte solution flow chamber on one side of each membrane and a negative electrolyte solution flow chamber on an opposite side thereof,

said plurality of alternately disposed bipolar plate electrode elements and ion exchange membrane separator elements being sealingly assembled together in a filter-press arrangement between two end electrode elements electrically coupled into an electric circuit which includes an electrical source forcing a current through the electrochemical reactor or an electrical load absorbing a current from the electrochemical reactor,

said bipolar plate electrode elements and said ion exchange membrane separator elements including a frame portion of an electrically nonconductive and chemically resistant material cooperating with sealing gasket means for sealing, and having through holes and recesses in coordinated locations forming, upon assembly, ducts for a separate circulation of a negative electrolyte solution and of a positive electrolyte solution, cascadedly in all said negative electrolyte solution flow chambers and in all said positive electrolyte solution flow chambers, respectively,

wherein each of a plurality of frames of said bipolar plate electrode elements and of said ion exchange membrane separator elements have an inner flange portion recessed from a first planar face of the frame on an opposite side of an other face of the frame having grooves for accommodating O-ring gaskets around pass-through electrolyte-ducting holes and around an outer seal perimeter, accommodating thereon a

perimetral portion of the respective bipolar plate electrode or ion exchange membrane separator;

a plurality of retention pins projecting out of the surface of said flange portion and passing through holes of said perimetral portion of the plate electrode or membrane separator accommodated thereon;

a retention counterflange of an electrically nonconductive and chemically resistant material having holes coordinated with the positions of said retention pins and functionally mounted over said perimetral portion of said plate electrode or said membrane separator on said recessed flange portion of the frame, and permanently fixed thereon by flattened heads of said retention pins protruding out of said coordinated holes of the counterflange; and

pre-assembled bipolar plate electrode elements and membrane separator elements being alternately stacked in a horizontal position with said other face of the frames carrying the O-ring gaskets facing in an upward direction.

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2. (Amended) The electrochemical reactor of claim 1, wherein said other face and said first planar face of each frame portion have a plurality of keying and alignment pins and sockets, respectively, of different shape from each other,

said plurality of keying and alignment pins and sockets preventing the stacking of said bipolar plate electrode elements and said ion exchange membrane separator elements in an incorrect alternate order and in an incorrect orientation.

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4. (Amended) The electrochemical reactor of claim 1, wherein a direction of flow of said negative electrolyte solution opposes a direction of flow of said positive electrolyte solution in respective flow chambers along opposite sides of each ion exchange membrane separator.

A2

5. (Amended) The electrochemical reactor of claim 1, wherein each of said bipolar plate electrodes comprises a fluid-impervious, electrically conductive plate,

said electrically conductive plate having, on opposite faces thereof, porous fluid-pervious three-dimensional electrode structures including a material of carbon fibers bonded in electrical continuity to said electrically conductive plate,

the electrolyte solution entering the electrode chamber along one side and exiting the chamber from an opposite side,

wherein said porous electrode structure has two distinct comb-shaped channelworks,

each of a plurality of finger channels of a source channelwork being substantially parallel to each other and interleaved with a plurality of substantially parallel finger channels of a drain channelwork;

the source comb-shaped channelwork having a base manifolding channel running along a side of a chamber through which the electrolyte solution is fed into the chamber, and the drain channelwork having a base manifolding channel running along an opposite side of the chamber from which the electrolyte solution exits the chamber;

wherein all finger channels of said source channelwork extend from the respective base manifolding channel and terminate short of reaching the manifolding channel of the drain channelwork.

6. (Amended) The electrochemical reactor of claim 1, wherein the ducts for the separate circulation of each of said negative and positive electrolyte solutions defined by said through holes across the thickness of each frame portion of said bipolar plate electrode elements and of said ion exchange membrane separator elements are defined by two or more holes spaced along one side of the substantially rectangular frame portion.

Please add the following new claim:

7. (New) A multicell electrochemical reactor, comprising:

a plurality bipolar plate electrode elements;

a plurality of ion exchange membrane separator elements,

said plurality of bipolar plate electrode elements and said plurality of ion exchange membrane separator elements each being alternately disposed in a horizontal direction and stacked with respect to each other along a vertical direction,

wherein each of said plurality of ion exchange membrane separator elements has a positive electrolyte solution flow chamber on a first side and a negative electrolyte solution flow chamber on a second side thereof;

a plurality of frame portions each associated with a respective plate electrode element and a respective ion exchange membrane separator element,

wherein each of said plurality of frame portions includes, on a surface thereof, a separate duct for each of a positive electrolyte solution and a negative electrolyte solution, and includes a through hole permitting cascade communication of electrolyte solution with an adjacent bipolar plate electrode element and an adjacent ion exchange membrane separator element; and

a bottom end electrode and an upper terminal electrode, wherein the bottom end electrode and the upper terminal electrode sandwich the plurality of bipolar plate electrode elements and the plurality of ion exchange membrane separator elements therebetween.